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Title : Prey Detection by Coastal Bottlenose Dolphins: Testing the Passive Listening Hypothesis

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Abstract : Soniferous fishes are prevalent in the diet of bottlenose dolphins (Tursiops truncatus), leading to the hypothesis that these predators detect prey by passive listening. We tested this hypothesis using a combination of passive acoustic surveys and playback experiments. First, to determine whether dolphin distribution was correlated with sound production by fish, we conducted synoptic surveys of dolphin distribution, fish calling, and prey abundance in the Neuse River, NC. Dolphin distribution was correlated more strongly with the rate of prey calling (Spearman rank correlation: $r_s=0.59$, $P<0.001$) than with any other factor, including prey abundance. We estimated that individual fish were detectable from up to 50 m whereas maximum detection range for large aggregations was 630 m. To test whether dolphins responded to the sounds of individual fish, we performed controlled playback experiments with free-ranging dolphins in Sarasota, FL. We used prey calls and snapping shrimp (Alpheus sp.) as experimental and control treatments, respectively, and measured the dolphins' direction of travel and rate of echolocation as response variables. Dolphins changed their direction of travel significantly, turning toward the sound source when fish sounds were played (Wilcoxon signed ranks test: $Z=-2.429$, $P=0.015$). In addition, dolphins significantly increased their echolocation rate following playbacks of fish sounds ($Z=2.676$, $P=0.007$). The sounds of snapping shrimp elicited neither a directional nor an echolocation response. We conclude that bottlenose dolphins use passive listening at two distinct spatial scales: (1) by listening for prey aggregations to select foraging habitat (hundreds of meters) and (2) by detecting the calls of individual fish at short ranges (meters to tens of meters). By listening passively, dolphins may obtain useful information on the identity, number, size, and location of prey.